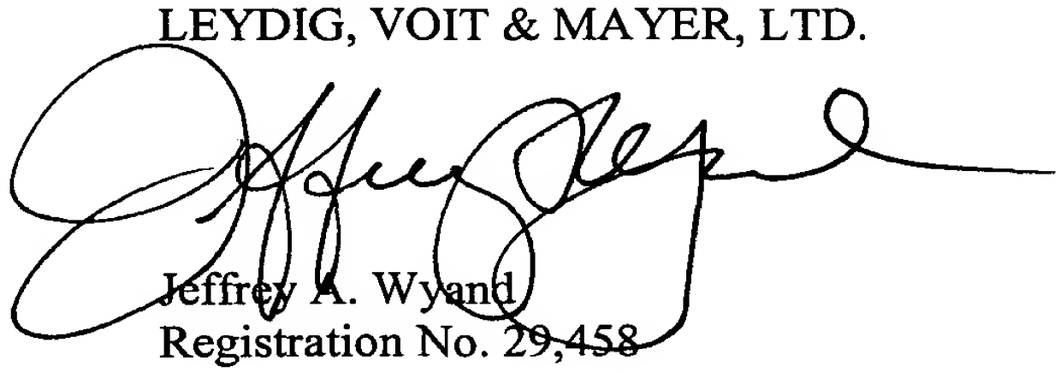
REMARKS

The foregoing Amendment corrects translational errors and conforms the claims to United States practice.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.



Jeffrey A. Wyand
Registration No. 29,458

Suite 300
700 Thirteenth Street, N.W.
Washington, D.C. 20005
Telephone: (202) 737-6770
Facsimile: (202) 737-6776

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JAW:ves

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Attorney Docket No. 401256/TAKADA

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

GOTOU et al.

Application No.: Unassigned

Filed: June 18, 2001

For: HIGH FREQUENCY POWER AMPLIFIER

Art Unit: Unassigned

Examiner: Unassigned

SPECIFICATION, CLAIMS AND ABSTRACT AS PRELIMINARILY AMENDED

Amendments to the paragraph beginning at page 1, line 13:

In conventional high frequency power amplifiers used in microwave or millimetric-wave telecommunications equipment for mobile communications or satellite communications, it is well known that the efficiency of transistor operation is higher if the load at the frequencies of not only the fundamental waves but also higher harmonics of the output circuit of a transistor is controlled, as compared with the case where only the load of fundamental waves is controlled. Here, the fundamental waves are the waves that have the lowest frequency, and the higher harmonics are a series of waves, each of which has a frequency that is an ~~integral~~ integer multiple of the fundamental frequency.

Amendments to the paragraph beginning at page 1, line 22:

It has been reported that there are the optimal load conditions for high-efficiency operation in input high frequency loads. For example, Japanese Patent No. 2695395 titled "High Frequency Power Amplifier" discloses that the control of input-side higher harmonics is effective for improving ~~a~~ drain efficiency; the input-side higher harmonic control circuit has a resonance frequency with respect to frequencies lower than the frequency of the 2nd harmonic; there are optimal load conditions in the input impedance range of (0 + j4 Ω), (0 + j25 Ω), (5 + j25 Ω), and (5 + j4 Ω); and the efficiency of

operation can be higher when the impedance of the 2nd harmonic is set in a low range. Here, higher harmonics, each of which has a frequency that is an odd-number multiple of the fundamental frequency, are called odd number~~-order~~ higher harmonics; and higher harmonics, each of which has a frequency that is an even-number multiple of the fundamental frequency, are called even number~~-order~~ higher harmonics.

Amendments to the paragraph beginning at page 2, line 10:

As described above, conventional circuit configurations for realizing~~-the~~ high efficiency~~-of the~~ operation of transistors in a high frequency power amplifier have a problem in that the circuit configurations are limited to make the input-side even-number~~-order~~ higher harmonic load of the impedance matching circuit a short-circuit load.

Amendments to the paragraph beginning at page 2, line 15:

Furthermore, such a high frequency power amplifier~~-have~~ has a problem in that the higher the frequency of a signal, that is the higher the order of~~-higher~~ the harmonics, the smaller the amplitude of the higher harmonics reflected from the higher harmonic processing circuit until the higher harmonics reach the input end of the transistor due to propagation loss in a line, and sufficient reflection cannot be obtained.

Amendments to the paragraph beginning at page 3, line 29:

Fig. 1 shows a circuit configuration of a high frequency power amplifier in a First Embodiment of the present invention.

Amendments to the paragraph beginning at page 4, line 3:

Fig. 3 shows a circuit configuration of a high frequency power amplifier in a Second Embodiment of the present invention.

Amendments to the paragraph beginning at page 4, line 5:

Fig. 4 shows a circuit configuration of a high frequency power amplifier in a Third Embodiment of the present invention.

Amendments to existing claims:

1. (Amended) A high frequency power amplifier, comprising:

a transistor for amplifying signals; and

an input-side impedance matching circuit connected to an input side of said transistor, wherein said input-side impedance matching circuit ~~makes~~ provides an impedance of a substantially open circuit load with respect to even number ~~order~~ higher harmonics of a fundamental wave of a high frequency signal.

2. (Amended) The high frequency power amplifier according to claim 1, wherein a phase angle of reflection of a second ~~higher~~ harmonic is 0 to 90 degrees, and ~~a quantity of~~ reflection is 0.6 to 1.0, with respect to a reflection coefficient when said input-side impedance matching circuit is viewed from ~~a direction of an~~ the input ~~end~~ side of said transistor.

3. (Amended) The high frequency power amplifier according to claim 2, wherein said input-side impedance matching circuit comprises a third ~~higher~~ harmonic reflecting circuit, a second ~~higher~~ harmonic processing circuit, and a fundamental wave matching circuit, disposed sequentially from a ~~side of a~~ signal input terminal.

4. (Amended) The high frequency power amplifier according to claim 1, wherein said input-side impedance matching circuit comprises a ~~third~~ higher harmonic reflecting circuit, a second ~~higher~~ harmonic processing circuit, and a fundamental wave matching circuit, disposed sequentially from a ~~side of a~~ signal input terminal.

5. (Amended) A high frequency power amplifier, comprising:

a transistor for amplifying signals; and

an input-side impedance matching circuit connected to an input side of said transistor, wherein said input-side impedance matching circuit ~~makes~~ provides an

impedance of a substantially short-circuit load with respect to odd number ~~order higher~~ harmonics of a fundamental wave of a high frequency signal.

6. (Amended) The high frequency power amplifier according to claim 5, wherein a phase angle of reflection of a third ~~higher~~ harmonic is 110 to 270 degrees, and ~~a quantity of~~ reflection is 0.6 to 1.0, with respect to a reflection coefficient when said input-side impedance matching circuit is viewed from ~~a direction of an~~ the input ~~end~~ side of said transistor.

7. (Amended) The high frequency power amplifier according to claim 6, wherein said input-side impedance matching circuit comprises a third ~~higher~~ harmonic reflecting circuit, a second ~~higher~~ harmonic processing circuit, and a fundamental wave matching circuit, disposed sequentially from ~~a side of~~ a signal input terminal.

8. (Amended) The high frequency power amplifier according to claim 5, wherein said input-side impedance matching circuit comprises a third ~~higher~~ harmonic reflecting circuit, a second ~~higher~~ harmonic processing circuit, and a fundamental wave matching circuit, disposed sequentially from ~~a side of~~ a signal input terminal.

9. (Amended) A high frequency power amplifier, comprising:

a front stage transistor;

a rear stage transistor; and

an inter-stage impedance matching circuit connected between said front stage transistor and said rear stage transistor for matching impedances, wherein higher harmonics generated in said front stage transistor ~~is~~ are inputted into said rear stage transistor, and a higher harmonic load of said rear stage transistor is adjusted by said inter-stage impedance matching circuit.

Amendments to the abstract:

Abstract of the Disclosure

A high frequency power amplifier that can improve~~ an~~ efficiency of an operation of a transistor without limiting any input-side higher harmonic load of an impedance matching circuit to a short-circuit load, and can increase~~ a quantity of~~ reflection of higher harmonics. By adjusting line lengths~~ L1 to L5~~ and line widths~~ W1 to W5~~ of~~ the~~ signal lines~~ 1 to 5~~, a 2nd~~ higher~~ harmonic can be adjusted to be an open load (a reflected phase angle of Γin: 0 – 90°, the quantity of reflection: 0.6 – 1.0), and a 3rd~~ higher~~ harmonic is adjusted to be a short-circuit load (the reflected phase angle of Γin: 110 – 270°, the quantity of reflection: 0.6 – 1.0). ~~By~~<u>With</u> this~~ optimization of an~~ input-side higher harmonic load of the impedance matching circuit,~~ an~~ efficiency of transistor operation can be improved. By disposing a higher harmonic processing circuit~~ 12 of higher orders~~ closer to a transistor~~ 1~~,~~ there is provided~~ a high frequency power amplifier with a shortened line length between the higher harmonic processing circuit~~ 12~~ and the transistor ~~1~~, and increased quantity of reflection of higher harmonics <u>is produced</u>.